

Notas breves

Additional information on the biology of *Argonauta argo* (Cephalopoda: Octopoda) in the Mediterranean Sea from gastrointestinal contents of Risso's dolphin

Aportación a la biología de *Argonauta argo* (Cephalopoda: Octopoda) en el mar Mediterráneo a partir del contenido gastrointestinal del delfín de Risso

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KEY WORDS: *Argonauta argo*, *Grampus griseus*, cephalopod biology, Mediterranean.

PALABRAS CLAVE: *Argonauta argo*, *Grampus griseus*, biología cefalópodos, Mediterráneo.

INTRODUCTION

Argonauta argo Linnaeus, 1758 is a cosmopolitan epipelagic octopod living in tropical and subtropical waters. It is sexually dimorphic, with dwarf males and females lodged in calcareous shells that serve as brood chambers (GUERRA, 1992). Despite its abundance, whole animals are rarely caught, so that their life cycle is not completely known. The reproduction of this species shows a protracted and continuous spawning which has been defined as asynchronous ovulation with monocycle spawning reproductive strategy (ROCHA, GUERRA AND GONZÁLEZ, 2001).

Living individuals of this species are rarely found in the Mediterranean Sea (BOLETZKY AND CENTELLES, 1979; BELLO AND RIZZI, 1990; POPPER, BARASH AND GALIL, 1990). Continuous spawning is believed to take place in the eastern

Mediterranean Sea (LAPTIKHOVSKY AND SALMAN, 2003), but the life span and period of reproduction of the species continue to be unknown. The aim of this paper is to provide some data on the biology of this little known Mediterranean species by means of remains collected from the gastrointestinal contents of Risso's dolphins, *Grampus griseus* (Cuvier, 1812) (Cetacea: Delphinidae), a teuthivorous predator (KRUSE, CALDWELL AND CALDWELL, 1999).

MATERIAL AND METHODS

The data analysed in this paper came from gastrointestinal contents of eleven Risso's dolphins, *Grampus griseus*, stranded on the west Mediterranean coast, between 40° 25' N, 00° 32'

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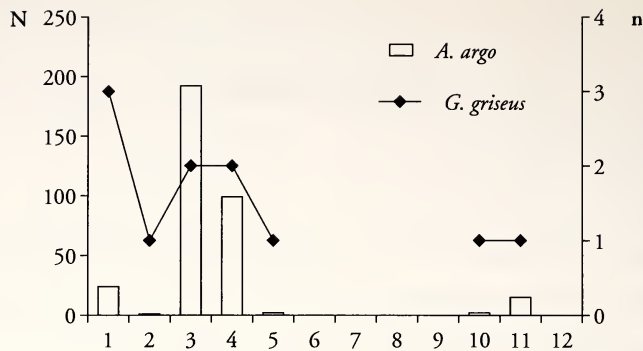


Figure 1. Annual distribution of specimens of *Argonauta argo* from gastrointestinal contents of Mediterranean Risso's dolphin. N: number of *A. argo*; n: number of dolphins.

Figura 1. Distribución anual de los ejemplares de *Argonauta argo* obtenidos del contenido gastrointestinal del delfín de Risso en el Mediterráneo.

W and 37° 35' N, 00° 45' E, collected from April 1987 to January 2003. All gastrointestinal tracts were stored deep-frozen (-20°C) and their contents subsequently washed through a 0.2 mm mesh sieve and preserved in 70% ethanol; glycerine was added to the preservative solution for cephalopod beaks.

The beaks were identified according to SMALE, CLARKE, KLAGES AND ROELEVELD (1993). Cephalopod mantle length was estimated from hood length of lower beak (SMALE ET AL., 1993), due to the frequent rotten condition of the crest. Some underestimating of hood length and, hence, mantle length may be assumed because of the digestive action.

RESULTS

In the gastrointestinal contents of Risso's dolphins, 336 lower beaks of *Argonauta argo* were found, hood length range: 1.31-5.87 mm. Distribution through the time period for which data were available (see Figure 1) shows a higher number in early spring. The estimated mantle lengths are shown in Figure 2. Significant differences were found in the size of specimens throughout the year (nested ANOVA ($F_{9,325} = 11.1$, $P < 0.001$). The frequency distribution of beak length (HL) in the months of maximum abundance, March and

April, is shown in Figure 3; significant length distribution differences were found between these two months (Kolmogorov-Smirnov test, maximum differences between samples = 0.268, $N(192, 99)$, $P < 0.001$), 25.6-28.7 mm and 31.8-35.0 mm being the estimated mantle length of modal class in March and April, respectively. In all available samples there were individuals whose mantle length was longer than 35 mm. An oviscapte with eggs (modal value size 1.22-1.42 mm length) was found in the intestine of a dolphin stranded in January; this value may be underestimated due to the possible shrinking action of preservation in alcohol.

DISCUSSION

The high number of beaks from *A. argo* gathered in this study, in contrast with the scarcity of their catches (see the Introduction), corroborates the effectiveness of teuthophagous predators as cephalopod collectors (BELLO, 1996).

All remains of *A. argo* found in this study, apart from one collected in April, were ascribed to female specimens based on their size, since dwarf males only reach 10 mm of dorsal mantle length (GUERRA, 1992). In accordance with the smallest female size at maturity in the Mediterranean, i. e. 32 mm ML

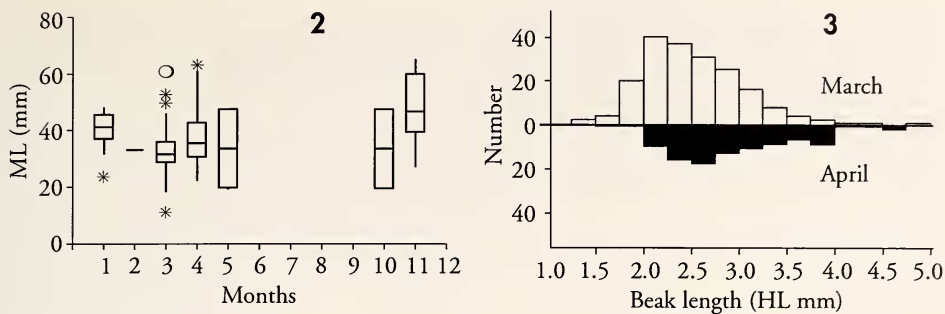


Figure 2. Annual length distribution of estimated mantle length (ML) of *Argonauta argo* from gastrointestinal contents of Mediterranean Risso's dolphin. Box-and-whisker-plot (TUKEY, 1977).

Figure 3. Frequency distribution of lower beak length (HL) of *Argonauta argo* in March and April. *Figura 2. Distribución anual de la longitud estimada del manto (ML) de Argonauta argo a partir del contenido gastrointestinal del delfín de Risso en el Mediterráneo. Gráfico "Box-and-whisker" (TUKEY, 1977). Figura 3. Distribución de la frecuencia de la longitud de la mandíbula inferior (HL) de Argonauta argo en marzo y abril.*

(LAPTIKHOVSKY AND SALMAN, 2003), mature females were present in all sampled seasons. Such a find and the occurrence of fertilized eggs in the brooding chamber from January, in addition to brooding females collected in the Adriatic in November (BELLO AND RIZZI, 1990) and mature females found in the eastern Mediterranean Sea during winter (LAPTIKHOVSKY AND SALMAN, 2003), show that the spawning period for Mediterranean *A. argo* extends longer than previously believed (from May to October according to GUERRA, 1992). Differences

in the size of specimens through the year, especially in the two consecutive months could indicate either seasonality or a preferential period of spawning time.

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